VIRTUAL TEAMS AND TECHNOLOGY: THE RELATIONSHIP BETWEEN TRAINING AND TEAM EFFECTIVENESS

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The impact of training on virtual team effectiveness was assessed in five areas: communication, planning tasks and setting goals, solving problems and making decisions, resolving conflict, and responding to customer requirements. A 12-page survey was developed exploring all aspects of virtual teams. 180 surveys were distributed, 52 were returned representing 43 companies. Training led to higher effectiveness in planning tasks and setting goals, solving problems and making decisions, and conflict resolution, but not in communication and responding to customer requirements. Training may not solve all the problems that virtual teams will encounter; however, training will make the challenges easier to handle.

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CHAPTER 1

INTRODUCTION: VIRTUAL TEAMS AND TECHNOLOGY

As globalization becomes the norm in organizations trying to expand their enterprises, more companies are finding that members of the same team are no longer collocated, but geographically dispersed. Companies in different parts of the country are now finding that they have to work with others outside of their geographical area. In organizations where coworkers form teams in the same physical location, the advent of globalization efforts has led to people working with others who are dispersed through time and physical location. This new type of team is called a virtual team.

Virtual teams

Like a typical team, a virtual team is a group of people who interact through interdependent tasks guided by common purpose (Katzenbach & Smith, 1993, p.14; Lipnack & Stamps, 1997, p.7). However, unlike a typical team, a virtual team works across space, time, and organizational boundaries with links strengthened through communication technologies (Lipnack & Stamps, 1997), including groupware, technologies such as email, audio conferencing centers, and video conferencing technology (Coleman, 1997).

Team Types

Virtual teams are a new type of team. In traditional organizations, other types of teams may exist. Mohrman and Mohrman (1997, p. 2-2) outlined five different types of teams in typical organizations and their purposes. Mohrman and Mohrman stated that

many organizations use a combination of these teams in order to complete work. The five different team types are described below.

1. Work team. A work team performs the core work in an organization. They convert knowledge, labor, and raw materials into products or services that deliver value to the customer. An example of this kind of team is a production team that produces goods and services for internal and/or external customers.
2. Integrating team. Integrating teams coordinate and integrate work across the organization and/or across teams. These teams link together different teams that may be interdependent upon one another (e.g., through a shared customer). The goal of the team is to coordinate efforts toward a shared focus.
3. Management Team. Management teams are special kinds of integrating teams. They make authoritative decisions about strategy, priorities, resource allocation, and organization for a business unit with multiple teams.
4. Involvement Team. Involvement teams are representative teams that perform tasks that were once the domain of management, such as coordinating the performance management process.
5. Improvement team. Improvement teams plan and introduce changes to the organization to improve its performance. A quality improvement team is an example.

Sundstrom and Associates (1999, p. 22) added another team type called a parallel team. A parallel team is a temporary, ad hoc committee appointed by managers to make suggestions or recommendations. Parallel teams have no authority beyond their specific mandate.

Virtual teams could be any of the above types of teams, but they work across time and distance (Lipnack & Stamps, 1997, p.6). They use communication technologies to perform their tasks. Virtual teams are usually temporary in nature.

Teams vs. Groups

Although a virtual team requires information technology to get its work done, it is still, first and foremost, a team. And in order to gain the benefits that come from teamwork, it is important for managers and team members to understand how teams differ from regular working groups. Table 1 summarizes the differences between work groups and teams. A working group usually has a common superior to whom everyone reports, has some face-to-face interaction, and has some degree of interdependence in carrying out tasks (French, 1995). Working groups also rely on the sum of individuals for their performance, and their collective work products are the result of individual efforts, not a joint effort (Katzenbach & Smith, 1993).

A team, on the other hand, is a form of a working group, but a team has a higher degree of interdependence and interaction, as well as a higher commitment to common goals. A team's common goals are what cause team members to commit to take the risks which go hand in hand with conflict, joint work products, and the collective action that is necessary to build a common purpose, a common set of goals, and a commonly agreed upon approach. Unlike a working group, a team strives for a collective work product that is greater than what its members could achieve individually (Katzenbach & Smith, 1993).

Like teams, working groups benefit from a clear purpose and common understanding of performance expectations. But unlike teams, a working group pays attention to individual outcomes and results, and members often compete with one

another as they pursue their own individual performance targets. Members of working groups seldom, if ever, take responsibility for results other than their own. Teams require both individual and mutual accountability (Katzenbach & Smith, 1993).

Katzenbach and Smith (1993) define teams as groups of people who come together to:

- Develop a shared purpose
- Define a shared way of working
- Agree on performance goals
- Hold themselves accountable for results
- Develop complementary skills

Table 1

Comparison of Work Groups and Teams

Work Groups	Teams
Strong, clearly focused leader	Shared leadership roles.
Individual accountability.	Individual and mutual accountability.
The group's purpose is the same as the broader organizational mission.	Specific team purpose that the team delivers.
Individual work-products.	Collective work-products.
Runs efficient meetings.	Encourages open-ended discussion and active problem-solving meetings.
Measures its effectiveness indirectly by its influence on others (e.g., financial performance of the business).	Measures performance directly by assessing collective work-products.
Discusses, decides, and delegates	Discusses, decides and does real work together.

Note. Adapted from Katzenbach and Smith, 1993.

Team Activities

Teams are comprised of two or more (typically 5 to 10) individuals with different skills and areas of expertise; however, when they are brought together there are teamwork activities which must occur. Stevens and Campion (1994) conducted an extensive review of the literature and identified two major categories (Interpersonal and Self-Management)

of knowledge, skills, and abilities (KSAs) required in teamwork, with five subcategories and 14 specific KSAs summarized below. From these categories, it is possible to identify common team activities that occur, no matter what kind of work a team does. The five subcategories of KSAs that are required for teamwork are:

Interpersonal

1. Conflict Resolution. This includes the ability to recognize and encourage desirable, but discourage undesirable team conflict. Team members must be able to identify the type and source of team conflict and implement an appropriate negotiation and/or conflict resolution strategy.

2. Collaborative Problem-Solving. Teams must be able to identify when problems require the participation of the entire team and when they don't. When the team does need to be involved, they must participate to the appropriate degree and learn to overcome the barriers to group problem solving.

3. Communication. Teams must be able to communicate openly and supportively, and learn to enhance communication where possible. The ability to listen and to interpret nonverbal messages of others is critical to effective communication, as is recognizing the importance of non-task related communication in relationship building.

Self-Management

4. Goal Setting and Performance Management. Teams need specific, challenging goals that are understood and accepted by all team members. A team's performance, as well as the performance of individual team members, must be

monitored and evaluated, and both teams and team members need feedback about their performance.

5. Planning and Task Coordination. Team and individual activities must be coordinated and synchronized, and information must be distributed appropriately. Expectations must be established for the team and its members and the workload among the individuals must be balanced.

It is important to point out that Stevens and Campion (1994) focused intentionally on the knowledge, skills, and abilities required in teamwork, and not on personality traits or dispositions such as initiative, trust, openness, helpfulness, flexibility, and supportiveness. Although these attributes are routinely mentioned as desirable team member characteristics, Stevens and Campion's study emphasized the personal attributes that can be influenced by management via selection procedures or training programs, rather than personality traits or dispositional attributes, which are presumed to be more stable characteristics of individuals. Furthermore, Stevens and Campion's list of KSAs required for teamwork does not focus on the technical KSAs required by the jobs. These researchers point out that technical capabilities of employees are a factor in all work systems, and are not unique to the team environment, therefore, for their purposes they chose not to include them.

Team Effectiveness

According to Stevens and Campion (1994), each team member must possess certain KSAs in order to work together most effectively. However, there are other factors that lead to team effectiveness. Sundstrom and Associates (1999) state that effectiveness starts with meeting the performance expectations of those who receive, use, or review the

team's output. Expectations of performance usually stem from managers, internal and external customers, and others. Depending upon which counterpart receives services, the performance expectations are different. For example, a customer usually expects quality, timeliness, low cost, and responsiveness of service. Managers expect that a team will meet customers' expectations and that they will be productive.

There is another component to effectiveness. Each member of a team needs to feel as though they are meeting their own expectations of satisfying work and working relationships in the team. According to Sundstrom and Associates, unless expectations are met, the team's ability to work together as a group is compromised. The overall definition of team effectiveness is the extent to which a work team meets the performance expectations of key counterparts—managers, customers, and others—while continuing to meet members' expectations of working with the team. Mohrman, Cohen, and Mohrman (1995) corroborated Sundstrom et al.'s definition.

Two other factors that contribute to team effectiveness are employee behavior and quality of work life. According to Cohen, Ledford, and Spreitzer (1996), employee behavior is defined as absenteeism and turnover. The more that absenteeism and turnover occur on a team, the less effective the teams will tend to be over time. Teams that also exhibit intra-team monitoring behaviors, where recognition is given for good task performance and feedback is given to improve task performance, tend to be more effective than teams that do not (Blickensderfer, Cannon-Bowers, & Salas, 1997; Brannick, Prince, & Salas, 1997).

Quality of work life also contributes to team effectiveness. Perception of the quality of work life versus actual events tends to be the major contributor to team

effectiveness (Cohen, Ledford, & Spreitzer, 1996). If an employee feels negatively toward the work environment, then team effectiveness suffers from lack of motivation to perform.

Information Technology and Teams: Effectiveness Criteria and Strategies

Information technologies (IT) present new challenges for managing team effectiveness. Electronic communication have different characteristics than face-to-face conversations, and they require team members to choose an appropriate mode to fit the situation. While information technology is an important element in supporting teams, it cannot make a poorly designed team working under unfavorable performance conditions effective (Zack & Serino, 1996).

Applying the principles of effective teamwork to multinational/multi-site teams has stretched the conventional wisdom about teams to its limit. Research by Lotus Institute (Zack & Serino, 1996) focused specifically on the issues of how teams can successfully use collaborative technology to improve their effectiveness. Their research framework suggests three key criteria for assessing team effectiveness – performance, process, and communication.

1. Performance Effectiveness

Every task and situation is different but the following are general concepts about how performance effectiveness should be framed and measured (Hackman, as cited in Zack & Serino, 1996):

- Work should be judged according to the criteria of the consumer, user, or stakeholders of the work.
- Effective teams meet or exceed their clients' performance standards.

- The team should not self-destruct in performing its work. All effective teams continue to improve their performance over time and enhance their ability to work together in the future.
- The team members should feel good about being part of the team and be satisfied with the team's performance. Effective teams enable their members to learn, grow, experience well- being, and develop professionally.

2. Process Effectiveness

Monitoring and managing the task process may do more to enhance performance quality than managing task outcome. An effective process is indicated by (adapted from Hackman, as cited by Zack & Serino, 1996):

- The amount of team effort being applied to the task. An effective team applies maximum effort to the task.
- The mix of skill and knowledge brought to bear on the task. An effective team applies the appropriate level and mix of skill, knowledge, and expertise to the task.
- The performance strategy employed by the team. An effective team applies a performance strategy appropriate to the task.

3. Communication Effectiveness

Communication effectiveness is another useful process indicator for communication-intensive teams and tasks. Communication is considered effective to the extent that (Zack & Serino, 1996):

- The team applies an appropriate communication strategy to the task.
- The appropriate members are included in the various communication networks of the team.

- The team's activities are well coordinated.
- The team engages in high quality communication, as evidenced by the reliable, accurate, timely, and meaningful exchange of information and knowledge among team members.

To summarize, the conditions under which a team operates, or its context, influences how a team performs its work. And how well the team goes about its work influences the quality of its overall performance. If a team's process is effective, and if the work conditions are favorable, then it should perform well and it will have good chance of developing an effective process.

Effectiveness Strategies

The Lotus Institute reports that team-support technology can directly influence the performance conditions affecting the process effectiveness criteria (Zack & Serino, 1996). Specifically:

- The technology can be especially useful for ensuring that sufficient effort is applied to the task. Electronic forums where the team can discuss its mission, performance standards, and expectations, facilitate mutual accountability by making team process output visible; and provide electronic communications to improve the coordination, synchronization, and integration of effort.
- Team-support applications can also ensure that there is an adequate level and mix of knowledge, skill and experience applied to the work. The technologies can provide access to expertise via computer conferencing, electronic mail, skills or experience databases, or information and knowledge repositories. Some teams use the technology to match available skills to their requirements via electronic brokering and skill

databases. Others discuss and archive what they learn during electronic debriefing sessions.

- Team-support technology can help teams develop appropriate performance strategies. An application may provide structured processes for generating, evaluating, and choosing strategies, offer electronic forums for strategy discussions, and/or serve as a repository for capturing and discussing models of the task situation. Furthermore, teams could electronically post and discuss goals and objectives or create an electronic repository for storing results of prior strategies.
- Team-support technologies can help support effective communication. These technologies offer flexible communication modes that transcend temporal, spatial, and organizational distance. It supports structured processes that can replicate effective communication rituals and can make the language and conceptual categories used by the team to communicate about its work explicit. In addition, team technologies support a range of essential communication modes including electronic mail, conferences, discussion databases and shared document repositories.

Traditional teams rely on frequent face-to-face meetings to support their team process. This is what helps them feel and act like a team. Virtual teams with geographically dispersed members need additional help to support their team process. Lisa Kimball (1998) of Metasystems Design Group, Inc. offers these effectiveness strategies for team leaders:

- Make the “whole” visible to everyone. Teams need to develop shared images of themselves as more than just a loose collection of related parts. Working as a whole allows a team to develop synergy and is what makes a team powerful. Team leaders

can help a distributed team develop a sense of wholeness by finding images to illustrate the idea (e.g., holograms or connect the dots type pictures), and then sharing them with the team. In addition, make sure everyone on the team has a photograph of their team, using a collage of individual pictures if it's not possible to gather the team together.

- Provide a "line of sight." Teams need to "see and feel" what's happening around them in an organization. When members feel disconnected they are not as effective. This becomes even more of a problem when a large group of team members are co-located and smaller groups are located in other places. These dispersed members often feel they are missing out on the action when they are not able to sit in on briefings, company announcements, and meetings with the larger group of team members. Carbon copying people on meeting minutes alone isn't enough. What they are missing and what they need a sense of is the context, the shared stories and emotional tone that is a natural part of a face-to-face gathering. One way to help distributed team members feel connected is to create space in the electronic communication system for informal swapping of stories and feelings about what's happening—a kind of "virtual water cooler."
- Catalyze rich conversations. Typically, distributed team conversations focus solely on logistical details, routine reports and administrative matters. It's critical to create time and space for the team to have multiple, rich conversations about a variety of subjects in order to support the essential creative energy of teamwork. These conversations are often the only shared experiences that the team has if they do not have the opportunity for face-to-face encounters.

- Amplify energy. The best team experiences are those where the collective creativity and ideas of the team produce an almost palpable energy that seems to fill the meeting room. Distributed teams can experience a kind of entropy effect where energy dissipates and drains out of the system because there is no physical "meeting room" to contain it. The challenge is to find ways to focus attention on parts of the team where something interesting is happening. Develop team norms where members send bulletins to the team about hot news items and find ways to celebrate accomplishments together, as a whole team, even when you're separated.

Create tracks and footprints in physical space. Without the shared physical space of a team meeting room and a common office environment to serve as reminders, distributed team members can lose the sense that they are part of the team. Seeing the team picture during the day is one way to make the team's presence more real. Create a sign or team in-box and make sure it's visible to everyone on the team. Circulate team "output," especially in a newly formed team, with some kind of team-specific heading and formatting. This puts it in a team context and demonstrates that ideas are coming from the whole team, not just a single member.

Training Issues

In order for any team to be effective, training is essential. Stevens and Yarish (as cited in Sundstrom et al. 1999) cited an example of a company where training played an integral role in developing fully self-managed teams. Self-managed teams are mature teams that perform for themselves many of the tasks that management used to perform, such as scheduling and monitoring performance (Mohrman, et al., 1995, p. 5). In fact, a national survey of managers indicated that training is a key factor in the success of work

teams and inadequate training is the greatest hindrance to effective team performance (Stevens and Yarish as cited in Sundstrom et al., 1999).

Stevens and Yarish (in Sundstrom, 1999) piloted teams in a manufacturing plant environment and required 40 hours of training. Based upon the KSAs defined in Stevens and Campion (1994), the following training topics were chosen for training:

- Introduction to the team concept
- Managing group dynamics
- Conducting effective team meetings
- Total quality training
- Goal setting for teams
- Team problem solving
- Managing individual team members' differences (i.e., personality profiling)
- Team building
- Interpersonal communication skills
- Constructive conflict resolution
- Collaborative decision making
- Diversity

Although the training was time-consuming, the time was invested into the training because it was deemed absolutely necessary to help aid in team effectiveness.

Identifying Competencies of Virtual Team Members Targeted for Training

In order to determine training needs, competencies (KSAs) need to be identified. Stevens and Campion 's (1994) review of the literature and subsequent teamwork KSA

requirements were based on the activities of co-located, traditional teams. What about distributed or virtual teams? Are the same KSAs and activities required of distributed team members who use technology to work together? Dr. Jay F. Nunamaker, Jr. and other researchers from the Center for the Management of Information at the University of Arizona inform us that distributed collaboration requires a complex set of tools, structures, and support to assist the human interactions required to accomplish goals and complete work (Coleman, 1997).

The traditional factors identified with high performing team implementation are important in the virtual environment as well. Effective communication skills, clarity of goals, and a focus on performance will continue to be critical attributes for virtual team members (Scott & Townsend, 1994). In order to take full advantage of the new environment, virtual team members will require basic teamwork training and development, and will also need training in team technologies. In addition, when team members are from different nationalities and cultures, they must be trained in how each of their respective cultures differ and how they can overcome these differences and use them to the team's advantage (Townsend, DeMarie, & Hendrickson, 1998).

The competencies of virtual team members must accommodate the team's cultural makeup, mission, geographic distribution, and technological capabilities. Team members and team leaders need basically the same competencies, although leaders' competencies should include more general management skills. Team leaders should have a proven track record in the ability to learn and coach others. They should understand the overall project, each work area, and each area's relationship to other areas and team members. They should possess interpersonal skills and understand group processes and the complex

interpersonal dynamics that can open or block the doors to productive teamwork (Odenwald, 1996).

Table 2

Competencies for Global Team Members

Dimensions	Competencies
Leadership	Tolerance for ambiguity. Flexibility. Persuasiveness. Patience. The ability to gain consensus. Coaching skills. An orientation to change.
Communication	Listening and interpersonal skills. Presentation and writing skills.
Project Management	Skills in delegating, scheduling, forecasting, interviewing, and strategic planning. A focus on bottom-line goals.
Conceptual	Skills in problem solving, decision making and negotiation. Open-minded. Innovative. Perceptive. Anticipative. Discerning.
Technical	Computer skills. Task and function oriented.

Note. Adapted from Odenwald, 1996.

Odenwald's (1996) Communication and Conceptual Competencies categories (see Table 2) are similar to Stevens and Campion's (1994) Interpersonal KSAs required

in teamwork. Both indicate the importance of listening and interpersonal communication skills. Both also list problem solving, decision making and negotiation skills. In addition, the Project Management Competencies of Odenwald's model are similar to Stevens and Campion's Self Management KSA Category, both of which include KSAs such as planning, task coordination, and scheduling.

Odenwald's competencies for global team members include two additional categories: Leadership and Technical. Odenwald lists Leadership competencies, such as coaching skills, which are similar to Steven's and Campion's Interpersonal and Self-Management KSAs. Technical competencies include computer skills and task and function orientation. Odenwald's list also includes personality-based dimensions such as the ability to be flexible, persuasive, and patience, while possessing an orientation toward change. (Odenwald, 1996).

Horvath and Duarte (1997) identified individual skills and knowledge necessary to the development and management of virtual teams (see Table 3), along with the following five roles that are part of and/or influence virtual teams:

1. The Project Leader is responsible for the output of the virtual project.
2. Team members are responsible for assisting with the main task.
3. The Resource Manager is responsible for assignment of personnel to virtual teams.
4. The Client Manager navigates the process between the client and the team.
5. The Senior Project Manager manages the work of several virtual teams.

Table 3

Skills and Knowledge for Virtual Teams

Team Member Role	Skills and Knowledge
Project Leader	• Building trust within teams • Tolerance for ambiguity and problem solving • Communication planning and execution • Ability to use different media to share information, problem solve, etc. • Meeting management skills • Interpersonal skills to keep individuals connected • Listening, especially on phone • Transitioning and orienting team members throughout the project • Understanding individual differences • Developing strategies to ensure participation.
Team Member	• Team dynamics and performance, especially as influenced by individual differences • Good oral and written communication skills • Project management including planning their

	part of the project, project status and documentation • Ability to resolve issues such as competing priorities • Flexibility to deal with ambiguity • Initiative
Resource Manager	• Listening • Sensitivity to cultural and personal backgrounds • Advocacy skills for assignments • Interpersonal concern • Personnel management • Smoothing the transition back into the resource pool after a long assignment • Managing competing needs of members
Client Manager	• Identifying the skill requirements of virtual teams • Systems requirement identification and verification
Senior Project Manager	• Encouraging the reporting of team problems with project managers • Maintaining the integrity of the resource

	allocation process • Facilitating learning and knowledge sharing between the individuals below them and project teams

Note. Adapted from Horvath and Duarte, 1997.

There are many similarities between Horvath & Duarte's (1997) list of skills and knowledge for virtual teams (see Table 3), Odenwald's (1996) competencies for global team members (see Table 2), and Stevens and Campion's (1994) KSAs for teamwork. They all list interpersonal skills (e.g., listening), communication skills (e.g., oral and written), and personal and task management skills e.g., planning and problem solving). What is different about Horvath and Duarte's model is that they categorize the necessary virtual skills and knowledge for each discrete virtual team member role.

Horvath and Duarte's research indicated that for each role, different competencies were needed. The issues of interpersonal skills, flexibility and ability to deal with ambiguity were seen as extremely important areas for development (Horvath & Duarte, 1997). To gain these competencies, training and coaching should be applied as an option or solution.

Competencies in a Virtual Environment

While virtual teams present a number of challenges, they also present the potential to recreate the way work is done. The virtual environment presents the opportunity for efficiencies and team synergy unrealized in traditional work interaction

(Townsend et al., 1998). John Verity, in a special 1994 issue of Business Week , the "Information Revolution Issue" (as cited in Townsend et al, 1998) wrote:

> That is the essence of virtualization: rather than simply recreating in digital form the physical thing we know as a letter, email reinvents and vastly enhances letter-writing. Unbound by barriers of time and space and endowed with new powers, the electronic letter does something new altogether. The same sort of thing happens when business, the arts, or government are reborn in digital form.

One of the greatest differences and challenges in the working environment of virtual teams is the process of virtual interaction. Although e-mail and document sharing capabilities have been available in traditional work settings for quite some time (over 30 years), these technologies have for the most part been used to merely support face-to-face meetings and telephone conversations. In the exclusively virtual work environment, the traditional social mechanisms that facilitate communication and decision-making are gone, and team members must find new ways to communicate and interact effectively within the technical context. These changes affect the way that individuals conduct their work and how they communicate and express themselves (Townsend et al., 1998):

- Virtual team members must learn new ways to express themselves and to understand others in an environment with an alternative sense of presence.
- Virtual team members need excellent team participation skills. Virtual team membership is often quite fluid, so effective teams will require members who can quickly assimilate into the team.
- Virtual team members will have to become proficient with a variety of technologies.

- Virtual team membership often crosses national boundaries, meaning a variety of cultural backgrounds may be represented on a team. This requires additional team member development and training in communication and cultural diversity issues.

Research (Townsend, et al., 1998) indicates communication dynamics are significantly altered when traditional communicative cues, (e.g., facial expression, gesture, and vocal inflection) are absent. For example, in email messages, subtleties in communication are more difficult to convey, which is the reason for emoticons. Emoticons are meant to capture the feelings of the person writing the message by using regular computer characters (ASCII) to create an expression. For example, the symbol ;-) denotes winking. Also, when participants are able to use a communication system anonymously, the group begins to lose distinctions among members' social and expert status (Dubrovsky, Kiesler, & Sethna, 1991; Finholt & Sproull, 1990). Within this virtual environment there exists an opportunity for enhanced organizational democracy and participation (Mantovanni, 1994).

Trust and Communication

Communication dynamics are truly important, especially when trying to convey support to team members. Training can certainly help people gain this competency (Duarte and Snyder, 1999, p. 23). Although Stevens and Campion (1994) stated that trust is not easily influenced, Duarte and Snyder state that trust is essential in virtual teams. Communicating support to other team members is about building trust with the group. There are three ways to build support through communication, or build trust: Performance and competence; Integrity; and Concern for the well being of others (Duarte and Snyder, 1999, p. 140-143).

To build trust, you must build a reputation for performance and competence. In order to do this, a team member must have a reputation for delivering performance and results. If a member seems incompetent, it erodes trust and the belief that a team can perform, not to mention the fact that the team's reputation is affected as well. Another factor that contributes to performance and competence is follow-through. Common sense dictates that promising something and then not following through on that promise erodes trust. Follow-through is important because it is one of the few clues that a team member has that another team member is committed to the performance of the team. For team leaders, the ability to obtain resources can build the appearance of performance and competence. A leader who cannot provide resources to the team sends the message that he or she cannot perform for the team (Duarte & Snyder, 1999, p. 140).

Integrity is also important when building trust. Behaviors that indicate integrity are standing behind the team and all its members and maintaining consistent and balanced communication. Standing behind the team and its members shows cohesiveness and belief in the ability of the team to perform. Speaking negatively of the team can ruin the team's reputation and show a lack of integrity and judgment. Communication is also a key factor to building integrity. By communication, Duarte and Snyder (1999, p. 142) mean that everyone on the team receives critical information needed to perform the job at the same time. The team members who receive information last can feel excluded or forgotten, which will ultimately erode trust over time if it continues.

When building trust, concern for the well being of others is essential. The two aspects critical to establishing trust are transitioning people on and off the team in order to affect their careers positively and understanding the impact of the team's actions on

people inside or outside the team. Expressing concern for team members transitioning on and off the team can happen in two ways. The leader and other team members hold explicit discussions on transitions and the leader and other team members help one another find next assignments. The amount of help received in transitions and career management show concern for the well being of the team member leaving the group. Showing consideration for how your actions affect other team members also expresses concern for others. A decision that adversely affects another project, team, or team member can reduce trust among the group (Duarte & Snyder, 1999, p.143).

The KSAs mentioned earlier Duarte & Snyder, 1999) imply skill building, or training. Training in how to be a member of a virtual team is important. Duarte (as cited in Kiser, 1999) states that "no virtual team ever failed because of technology." Shell Oil has developed a formal training program for how to work in a virtual team. Called the Network Learning and Support Center, it serves as a place to go to for assistance and first aid (Kiser, 1999). The Support Center also has tools to help virtual team members work together more effectively. Geber (1995) also agrees that tending to the human side of the organization is essential in ensuring the success of a virtual team. Geber suggests that holding informal meetings for people to get to know each other and to get used to personalities helps members get acclimated to one another before they use technology to communicate.

Lipnack (as cited in Kiser, 1999) states that virtual team members must learn to think differently about how they develop and track goals, determine who belongs on the team at various stages, communicate with one another, and switch between leader and

follower. Lipnack's comments suggest that human factors are important in virtual teaming.

Collaborative Technologies and Training

Because information technology is such an integral part of virtual team operations, a discussion of information technology used to support virtual teams is warranted. The following 18 different types of collaborative tools are representative of those found in organization's today that support virtual teamwork. Research contributing to the 18 types is due in part to Coleman (1997); however, Johansen's (1988) list of 17 IT Support Mechanisms is truly the framework from which recent research has derived its information (Ballentine, Becker, Lee, and Townsley, 1999).

Table 4

18 Collaborative Tools

Tool	Definition
Audio Conferencing	Holding meetings usually by means of a standard telephone line with parties able to call in from different locations at the same time. An example would be a typical telephone conference call
Collaborative Presentation Software	Computer programs which permit many people to view a single presentation at the same time
Conference Room Videoconferencing	Holding meetings in a conference room using live video, essentially a telephone system with a visual component
Desktop Videoconferencing	Provides two-way audio/video conferencing using a PC-based system with near-broadcast quality. Allows point-to-point, spontaneous, very cost effective communication
Discussion Database	Databases that allow the capture and storage of an electronic discussion on designated subjects

Document Management	Electronic document capture and delivery, including the capability to view, print, copy, mark-up, and edit documents electronically. Functionality could include electronic imaging, optical character recognition, web related functionality, indexing, intelligent data searching and workflow design tools
Electronic Whiteboarding	Allows two or more people to view and draw on a shared drawing surface, in the same room or in geographically separated locations. Messages written on the board's surface are automatically transcribed electronically
E-mail/Electronic Messaging	Computer application which allows people to interact with one another, usually through a keyboard and monitor interface. At its most basic level, E-mail allows end-users to create, send, and receive messages. File transfers are also possible
Group Authoring	Software that allows several individuals to collaborate and share the responsibility of writing and editing a document or report

Group Decision Support Systems (GDSS)	Interactive computer-based system designed especially to support the decision process, especially in meetings. These systems typically support aspects of the decision process such as brainstorming, idea organization, evaluation, prioritization, and voting
Group Scheduling & Calendaring	Software which supports personnel and facilities event scheduling. Also, meeting management support, including meeting facilitation, and support for virtual, remote, or distributed meetings
Knowledge Management	Capturing, distributing and managing organizational knowledge by creating a repository for both structured and unstructured facts and opinions from throughout the organization and its environment
One-way Bulletin Boards (BBS)	System which allows posting of information for other individuals to access
Personal Communication Tools	Portable communication devices such as portable computers (laptops, notebooks, palm

	held, etc.,) with remote dialup capabilities, wireless phones, pagers, fax devices, etc.
Project Management Software	Software that automates workforce management and project coordination, including distributed project management, support for mobile working, sales force automation; for example, Microsoft Project software
Remote Dial-Up Access	Using a PC or a laptop to dial into the organization's main computer system from a distant location in order to send and retrieve information
Web Browser	Software which is used for viewing web pages and multimedia content, downloading applications and documents as well as providing information in web forms and uploading documents to a web server (e.g., Netscape's Navigator or Microsoft's Internet Explorer).
Work Flow Management System	Allows documents to be routed through organizations using a structured process. Workflow systems may provide features such

	as routing, development of forms, and support for differing roles and privileges. A simple example of a workflow application is an expense report in an organization, which an employee enters and then submits electronically. A copy is archived and routed to the employee's manager for approval. The manager receives the document, electronically approves it and sends it on for payment and archival

Note. Adapted from Johansen, 1988, Reprinted from Ballentine et al., 1999.

Although information technology does not lead to the downfall of virtual teams, Kiser (1999) pointed out that companies must also be aware of their employees' comfort levels with technology and their ability to use it, indicating that technology training is important in the implementation of virtual teams. If employees are not comfortable using technology, then they are sure to fail when trying to use the technology that is required in virtual teaming. Pape (1995) added that when using any kind of technology, it seemed impractical to thrust the technology upon a person without any indication of how to use it. Pape suggested eight steps in creating any kind of a virtual company—companies that use communications and information-technology. The eight steps are:

1. Use email
2. Automate tasks that waste people's time

3. Create a company-wide electronic filing cabinet
4. Be fanatic about monitoring and reporting performance
5. Build an infrastructure for creating teams on an as-needed basis
6. Motivate people to go online
7. Make all systems easy to use
8. Help people understand when they should and shouldn't use the tools

The last step emphasizes training. Pape stated that a company must train people in how to use tools and how to use them responsibly for communication or else those tools will do more harm than good. Therefore, training in how to use tools technically and training on how to use tools to communicate contribute to the effectiveness of a virtual team (Duarte & Snyder, 1999, p. 17). Duarte and Snyder recommend a formal training curriculum, continual on-line training, and technical support in order to ensure virtual teams have the support they need to ensure success.

Mankin et al. (1996) also recommended training in information technology and its impact on a team. They suggest that as soon as the system develops, so should the training in how to use the technology. The technology should match the team members' potential skills. If the technology is too far out of the reach of the team members' skill level, they will start feeling frustrated with the technology and will not use it. However, the converse is also true. If the technology is too easy to understand, then members' will not be allowed to exercise their skill, leading to abandonment of the training.

Knowledge about the infrastructure that allows teams to work together at a distance is also important for a team, although of lesser importance (Mankin et al., 1996, p. 20). Infrastructure is defined as the information technology hardware, platforms,

software environments, networks that serve the entire organization. Duarte and Snyder (1999, p. 16) insist that having access to the same infrastructure and understanding how it helps support collaborative work helps ensure effective teaming.

Training and Effectiveness of Virtual Teams

As previously mentioned, globalization and advances in information technologies have spawned a new type of team structure, i.e., virtual teams. Virtual teams are small groups of people working across boundaries supported by new computer and communications technologies (Lipnack & Stamps, 1997). Organizations are investing large amounts of time, money, and effort with the expectation that the impact of their virtual teams on the bottom line will justify their costs. Many organizations are disappointed in the results, however, and few are getting the returns they expected. The challenge facing many organizations today is how to fulfill the potential of teams and technology (Mankin, Cohen, & Bikson, 1996).

According to Stevens and Campion (1994), Horvath and Duarte (1997), and Odenwald, (1996), there are many KSAs involved in being an effective team member. Duarte and Snyder (1999) have pointed out that training in how to be a virtual team member (i.e., gaining the KSAs) is important in the success of any virtual team. In the survey developed by The Center for the Study of Work Teams and The Information Systems Research Center at the University of North Texas, a training question was developed about technology-supported work groups (i.e., virtual teams) that addresses the KSAs for teams and the KSAs for technology (Duarte & Snyder, 1999; Kiser, 1999; Mankin, Cohen, & Bikson, 1996; Pape, 1995). Because training in soft skills to be a team member and training for skills needed to use technology effectively both contribute to the

success of virtual teams, total amount of training should have a relationship with team effectiveness. If this is the case, it would stand to reason that the more training that a team member receives, the more effective a team would be in the five areas outlined in the survey. Those five areas are:

1) Communication (Stevens & Campion, 1994; Zack & Serino, 1996)

2) Planning tasks and setting goals (Stevens & Campion, 1994)

3) Solving problems and making decisions (Stevens & Campion, 1994)

4) Resolving conflict (Stevens and Campion, 1994; Sundstrom and Associates, 1999)

5) Responding to customer requirements (Mohrman, Cohen, & Mohrman, 1995; Sundstrom & Associates, 1999; Zack & Serino, 1996).

Because many authors have reiterated the KSAs and research of Stevens and Campion (1994) to use as the authority for effective teams, this study will also base the effectiveness characteristics (i.e., KSAs) for on the work of Stevens and Campion.

Hypotheses

Therefore, the main hypothesis proposed are as follows:

1) There is a significant difference between the degree of training (training or no training) and team effectiveness.

Assuming a significant overall effect, the following are subhypotheses:

1a) There is a significant difference between the degree of training (training or no training) and team effectiveness in communication.

1b) There is a significant difference between the degree of training (training or no training) and team effectiveness in planning tasks and setting goals.

1c) There is a significant difference between the degree of training (training or no training) and team effectiveness in problem solving and decision making.

1d) There is a significant difference between the degree of training (training or no training) and team effectiveness in resolving conflict.

1e) There is a significant difference between the degree of training (training or no training) and team effectiveness in responding to customer requirements.

CHAPTER 2

METHOD

Participants

Approximately 180 surveys were sent to virtual team members in 60 companies of which 52 participants representing 43 companies completed the survey that was jointly developed by The Center for the Study of Work Teams and The Information Systems Research Center at the University of North Texas (UNT). Industries responding included Oil & Gas, Manufacturing, Consulting, Computing Technology, Financial Services, Communication and Service/Retail, Healthcare, and other companies. Participants must have been working with team members through the use of technology across distance and time. In developing the survey, the term technology-supported work groups was used in lieu of the term virtual teams after a meeting with the client sponsor where it was determined that a set of richer data would result if we included work groups who did not consider themselves teams, but actually worked virtually with others. As a result, the term technology-supported work group was used to mean virtual teams and the term collaborative work group was used in lieu of the word team. The board determined our survey posed minimal risks to the participants.

Survey Materials

In August of 1998 The Center for the Study of Work Teams (CSWT) and The Information Systems Research Center (ISRC) at the University of North Texas conducted a benchmarking study of collaborative technologies across industries for virtual teaming.

This study centered on three key questions, some with multiple subparts. The three questions were as follows:

1. What collaborative tools are being used by other firms and for what purpose?
    - How frequently are they being used?
    - What percentage of the company population is using each tool?
2. Which collaborative tools have been most successful for the purpose in which they were implemented? Why?
3. Compare each firm's suite of collaborative tools and virtual teaming efforts with general industry.A 12-page survey was developed by the Center for the Study of Work Teams and a member of the Information Systems Research Center. The time required to complete the survey was approximately 45 minutes to one hour.

The survey also included a glossary of terms section, and questions pertaining to demographic information on the organization and individual, the organizations' use of, as well as individual personal involvement in, technology-supported collaborative work groups, critical factors for collaborative technology management and support, and the future use of collaborative tools. The full survey is available in the Appendix.

The training question asked about in the survey, which is pertinent to the study, is do you receive training in how to work effectively as a collaborative group member? Responses were measured on a two-point scale of 1 = Yes and 2 = No. Participants responded on a four-point Likert scale with 1 = Not Effective, 2 = Somewhat Effective, 3 = Effective, and 4 = Very Effective. The types of team effectiveness were

- Communication (e.g., giving feedback, sharing info)
- Planning tasks and setting goals

- Solving problems and making decisions
- Resolving conflict, and
- Responding to customer requirements.

Procedure

The study proceeded in three stages:

- Stage 1: The development and administration of a comprehensive survey instrument which would enable the researchers to assess the Virtual Teaming practices and the use of Collaborative Tools across industries. The survey was pilot tested with Chief Information Officers (CIOs) from five large DFW companies. One hundred thirty-eight surveys were mailed to over fifty companies; 35 usable replies from 30 companies were used in the final analysis for the client sponsor.
- Stage 2: A detailed written analysis of the survey results and a presentation to sponsors. Active involvement with the sponsor was sought and welcomed throughout the investigation. The success of the project was due in large part to the sponsor's involvement and knowledge of virtual teaming.
- Stage 3: A second phase of survey mailouts began where more data was being collected for further study for both The Center for the Study of Work Teams and The Information Systems Research Center. In the third phase, 42 more surveys were distributed and only 17 were returned for a total of 52 surveys used in this study.

The survey was mailed to the participants to fill out and mail back to us in a self-addressed stamped envelope in its entirety. The data were then entered and analyzed within a Microsoft Excel spreadsheet using simple averages.

The data was then imported into SPSS (Statistical Package for the Social Sciences for more sophisticated analyses. The independent variable is training consisting of two levels (yes or no) and the dependent variable is effectiveness (communication, planning tasks and setting goals, solving problems and making decisions, resolving conflict, and responding to customer requirements). A one-way Multivariate Analysis of Variance (MANOVA) with follow-up Analyses of Variance (ANOVAs) were conducted on the data to determine the impact of training on team effectiveness. Before the main analysis, Cronbach's alpha was run on the dependent variable to ensure that all levels were a part of the effectiveness construct.

CHAPTER 3

RESULTS

The main hypothesis that there is a significant difference between the degree of training (training or no training) and team effectiveness was analyzed using a Multivariate Analysis of Variance (MANOVA). There is one dichotomous independent variable (IV) consisting of degree of training (training or no training) and five dependent variables (DV) from the team effectiveness construct (communication, planning tasks and setting goals, problem solving and making decisions, resolving conflict, and responding to customer requirements). Before the MANOVA was run, Coefficient alpha was used to analyze the DV, measuring the internal consistency of the questions comprising the team effectiveness construct. The analysis resulted in a .73 value, indicating satisfactory reliability.

A one-way multivariate analysis of variance (MANOVA) was conducted to determine the effect of the training (training or no training) on the five dependent variables for team effectiveness (communication, planning tasks and setting goals, problem solving and making decisions, resolving conflict, and responding to customer requirements). Significant differences were found among the two training levels on the dependent measures. Wilks' $\Lambda = .65$, $\underline{F}(5, 34) = 3.63$, $\underline{p} = .01$. The multivariate η^2 based on Wilks' Λ was quite strong, .35. Table 5 contains the means and the standard deviations on the dependent variables for the two training groups.

Due to the significant results of the MANOVA, analyses of variances (ANOVA) were conducted on each dependent variable. The ANOVA on planning tasks and goal setting was significant, $F(1, 38) = 12.66$, $p < .001$, $\eta^2 = .25$. Receiving training makes a large difference in team effectiveness in the area of planning tasks and goal setting. The ANOVA on solving problems and making decisions was significant, $F(1, 38) = 6.36$, $p = .016$, $\eta^2 = .14$. The ANOVA on resolving conflict was also significant, $F(1, 38) = 7.64$, $p = .009$, $\eta^2 = .16$. Those who receive training are much more effective in solving problems and making decisions and resolving conflict. However, the ANOVA on communication was nonsignificant, $F(1, 38) = .86$, $p = .36$, $\eta^2 = .02$. The ANOVA on responding to customer requirements was also nonsignificant, $F(1, 38) = .86$, $p = .36$, $\eta^2 = .02$. There appears to be no difference in the effectiveness of the team in communication and in responding to customer requirements whether or not training was received. Table 6 summarizes the follow-up test results.

Table 5

Descriptive Statistics for Training on Effectiveness

Effectiveness	Training	Mean	Standard Deviation	N
Communication	Yes	3.00	.58	22
	No	2.81	.79	18
Planning Tasks &	Yes	3.18	.66	22
Setting Goals	No	2.42	.69	18
Solving Problems &	Yes	3.00	.76	22
Making Decisions	No	2.42	.69	18
Resolving Conflict	Yes	2.59	.85	22
	No	1.86	.80	18
Responding to Customer	Yes	3.00	.53	22
Requirements	No	2.81	.79	18

Table 6

Summary of F-ratios for Follow-Up Tests

Effectiveness Measure	F-ratio	p-value	Eta Squared
Planning tasks and setting goals	$F(1, 28) = 12.66$	$p < .001$	$\eta^2 = .25$
Problem solving and decision making	$F(1, 38) = 6.36$	$p = .016$	$\eta^2 = .14$
Conflict resolution	$F(1, 38) = 7.64$	$p = .009$	$\eta^2 = .16$
Communication	$F(1, 38) = .86$	$p = .36$	$\eta^2 = .02$
Responding to customer requirements	$F(1, 38) = .86$	$p = .36$	$\eta^2 = .02$

CHAPTER 4

DISCUSSION

The first hypothesis that there is a significant difference between the degree of training (training or no training) and team effectiveness was confirmed. The result suggests that receiving training does increase a team's overall effectiveness. Since the result was significant, we further investigated where training had the most significant differences in the effectiveness measure.

Upon further investigation, a significant difference between the degree of training (training or no training) and team effectiveness in planning tasks and setting goals. The difference between the groups is high and suggests that training in how to plan tasks and set goals increases the effectiveness of teams. Sundstrom and Associates (1999) and Stevens and Campion (1994) both stress the importance of planning tasks and setting goals in their work and seem to be an important part of virtual team effectiveness as well.

A significant difference also occurs between the degree of training (training or no training) and team effectiveness in problem solving and decision making. Stevens and Campion (1994) and Sundstrom and Associates (1999) stress the importance of problem solving and decision making in a team environment. In traditionally co-located teams, problem solving and decision making are important team activities. In virtual teams, the respondents to the survey also felt as though training in these activities helped them be more effective.

A significant difference also exists between the degree of training (training or no training) and team effectiveness in resolving conflict. Although significant, the effectiveness scores for both groups were low, which means neither group is really good at dealing with conflict even though training appears to make a difference. Conflict occurs in all teams simply because of all the personalities present on the team. Conflict resolution is therefore an important activity in which teams engage. For teams to be productive, the members within the team must be able to set aside differences quickly. The way that most teams learn how to resolve conflict is through training in conflict resolution techniques (Stevens and Campion, 1994; Sundstrom and Associates, 1999). Without tools on how to talk to one another during stressful situations, it is easy to default to our own personal habits. Training gives the tools necessary to resolve conflict. Training in how to resolve conflict in virtual teams is just as important according to the results of the study.

However, there was not a significant difference between the degree of training (training or no training) and team effectiveness in communication. Although Zack and Serino (1996) state that this is a competency that must exist in order for teams to be successful, it may be that communication is hard to train. Individuals have different ways of communicating based upon old habits. The nonsignificant result could very well be that habits are harder to break even with training. Another reason for a nonsignificant result could be that training in communication is easier to grasp in co-located teams. Since virtual teams are by nature dispersed, it may simply be that it takes more training, or different training, to make a difference in virtual teams.

Also, a nonsignificant difference occurred between the degree of training (training or no training) and team effectiveness in responding to customer requirements. Although responding to customer requirements is necessary in order for the customer to deem a virtual team successful, training does not seem to affect the team's effectiveness in this area. The nonsignificant result could mean that a team already knows that responding to the needs of the customer is important or else individual performance could come into question; if a team does not deliver, it would most likely reflect poorly on each member of the team. The purpose of all individuals and teams in an organization is to perform. Because it is common sense, training may not have an affect one way or another on effectiveness of the team.

Stevens and Campion (1994) have done extensive research in the area of teams and have determined the KSAs necessary for a team member to have in order to be successful in a team. Stevens and Campion, however, focused on co-located, traditional teams who work together in a face-to-face situation. The nonsignificant result in communication could very well be explained in the fact that virtual teams work differently than co-located teams and Stevens and Campion's (1994) work, therefore, is not the authority for virtual teams in the area of communication.

Conclusion

All of these things are important when training people in becoming a responsible and successful virtual team member. With all these skills being addressed, a virtual team has a good chance at becoming effective in the areas of planning tasks and setting goals (Stevens & Campion, 1994; Sundstrom and Associates, 1999), solving problems and making decisions (Stevens & Campion, 1994; Sundstrom and Associates, 1999), and

resolving conflict (Stevens & Campion, 1994; Sundstrom and Associates, 1999). Unfortunately, significance was not obtained for communication and responding to customer requirements. As stated earlier, it may very well be that communication is hard to train and responding to customer requirements is necessary and is common sense.

With training, a virtual team member should be well adept to handle most of the unfamiliar situations that may arise. Virtual teams are a relatively new concept to most people in organizations; therefore, training is more important than ever to ensure skilled workers and to ensure success. In a more global workplace, we may no longer have a choice in how we work together anymore, so in order to be more cost-effective in organizations, technology may be our answer to lessen travel costs and other expenses. If there is no longer a choice, then it is imperative that we educate virtual team members for optimum performance. Training may not solve all the problems that only time can solve, but training can certainly decrease the learning curve.

Future Study

In the survey, we investigated whether or not training was required with 17 collaborative tools a virtual team member uses in working with virtual teams. Since training appears to have an effect on the success of virtual teams, a future study using training and other variables as a predictor of success of a tool can be investigated. Success of the tool, percent of employees using the tool, frequency of use, how long has the organization used the tool, and are the tools part of a set of corporate standards were all measured. A simple regression using success as the DV can show whether or not the other variables discussed predict success, especially in light of whether or not training was required.

APPENDIX

COLLABORATIVE WORK GROUP TECHOLOGY SURVEY

Collaborative Work Group Technology Survey

Conducted by

University of North Texas
Center for the Study of Work Teams
and
Information Systems Research Center

Study Team Members

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University of North Texas
College of Arts and Sciences
Department of Psychology
Interdisciplinary Center for the Study of Work Teams

October 22, 1998

Collaborative Work Group Technology Survey

Dear Survey Participant:

In our global economy groups of people must work together despite being separated by time and distance, and computer-based technologies (e.g., groupware) are being used to support them. Because of this growing need, a benchmarking study is being conducted by the University of North Texas Center for the Study of Work Teams and Information Systems Research Center to determine how computer-based collaborative tools are being used to support dispersed work groups. We are surveying information technology experts (i.e., IT managers) and users (i.e., collaborative work group members) in several companies to determine best practice answers to the following questions:

- *What collaborative tools and technologies are being used and for what purposes?*
- *To what extent are they being used?*
- *Which tools have been most successful and why?*
- *How do companies organize and manage their collaborative technology efforts?*
- *What support practices (e.g., training) are associated with successful collaborative technology implementations and why?*

Please complete the attached survey and return it to the study team in the enclosed envelope by November 20, 1998. As always, we guarantee the complete anonymity of all participants. To help ensure a common framework for respondents, we have enclosed a glossary of terms in the survey. If you are not be able to answer questions for the whole company, please respond at the level that you have the most knowledge of collaborative work groups and their use of technology. Your company will receive a summary of our findings, including a review of the relevant literature and a description of how collaborative technology tools are being used.

If you know of technology experts and users in your company that we should reach to get a more accurate view throughout your company, please forward their names to a study team member listed on the cover page of the attached survey. Thanks in advance for participating in this study. If you have any questions, please contact your company point of contact or a member of the study team.

Sincerely,

Collaborative Work Group Technology Study Team

Enclosure

P.O. Box 311280 • Denton, Texas 76203-1280
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Collaborative Work Group Technology Survey
Glossary of Terms

Audio Conferencing
Holding meetings usually by means of a standard telephone line with parties able to call in from different locations at the same time. An example would be a typical telephone conference call.

Collaborative Presentation Software
Computer programs which permit many people to view a single presentation at the same time.

Collaborative Work Group
A group of individuals that truly share information and work to create a common understanding in order to accomplish a mutually shared work objective.

Conference Room Videoconferencing
Holding meetings in a conference room using live video, essentially a telephone system with an additional visual component.

Desktop Videoconferencing
Provides two-way audio/video conferencing using a PC-based system with near-broadcast quality. Allows point-to-point, spontaneous, very cost effective communication.

Discussion Database
Databases that allow the capture and storage of an electronic discussion on designated subjects.

Document Management
Electronic document capture and delivery, including the capability to view, print, copy, mark-up, and edit documents electronically. Functionality could include electronic imaging, optical character recognition, web related functionality, indexing, intelligent data searching and workflow design tools.

Electronic Whiteboarding
Allows two or more people to view and draw on a shared drawing surface, in the same room or in geographically separated locations. Messages written on the board's surface are automatically transcribed electronically.

E-mail/Electronic Messaging
Computer application which allows people to interact with one another , usually through a keyboard and monitor interface. At its most basic level, E-mail allows end-users to create, send, and receive messages. File transfers are also possible.

Face-to-Face (FtF)
The traditional ability to collaborate in person with others to get your group work done.

Group Authoring
Software that allows several individuals to collaborate and share the responsibility of writing and editing a document or report.

Group Decision Support Systems (GDSS)
Interactive computer-based system designed especially to support the decision process, especially in meetings. These systems typically support aspects of the decision process such as brainstorming, idea organization, evaluation, prioritization, and voting.

Group Scheduling & Calendaring
Software which supports personnel and facilities event scheduling. Also, meeting management support, including meeting facilitation, and support for virtual, remote, or distributed meetings.

Groupware
A set of computer software applications which allows two or more people to work together. Generally includes such functions as group brainstorming, voting, and discussion.

Knowledge Management
Capturing, distributing and managing organizational knowledge by creating a repository for both structured and unstructured facts and opinions from throughout the organization and its environment.

One-way Bulletin Boards (BBS)
System which allows posting of information for other individuals to access.

Personal Communication Tools
Portable communication devices such as portable computers (laptops, notebooks, palm held, etc.,) with remote dialup capabilities, wireless phones, pagers, fax devices, etc.

Project Management
Software that automates workforce management and project coordination, including distributed project management, support for mobile working, sales force automation; for example, Microsoft Project software.

Remote Dial-Up Access
Using a PC or a laptop to dial into the organization's main computer system from a distant location in order to send and retrieve information.

Web Browser
Software which is used for viewing web pages and multimedia content, downloading applications and documents as well as providing information in web forms and uploading documents to a web server (e.g., Netscape's Navigator or Microsoft's Internet Explorer).

Work Flow Management System
Allows documents to be routed through organizations using a structured process. Workflow systems may provide features such as routing, development of forms, and support for differing roles and privileges. A simple example of a workflow application is an expense report in an organization, which an employee enters and then submits electronically. A copy is archived and routed to the employee's manager for approval. The manager receives the document, electronically approves it and sends it on for payment and archival.

Virtual Teams (VT)
Virtual Teams (VTs) are groups of people who work closely together for a shared objective even though they are usually geographically separated by large distances. Their primary interactions are through a combination of collaborative technologies instead of face to face meetings.

Collaborative Work Group Technology Survey

Please complete the survey by writing the answers or placing a check mark in the circles where appropriate.

I. Demographic Information

1. a) Name of your parent company: _____

b) Industry: Check ONLY one circle

① Communications ② Computing Technology ③ Consulting
④ Finance/Accounting ⑤ Government ⑥ Healthcare
⑦ Oil and Gas ⑧ Manufacturing ⑨ Service/Retail
⑩ Other: _____

c) Your level in the company: Check ONLY one circle

① CEO ② VP/CIO ③ Director/Manager ④ Supervisor ⑤ Other _____

d) Which of the following categories of responsibility best describe your job? Check ONLY one circle

① Information Technology Development/Support
② Collaborative Work Group Technology Support
③ Collaborative Work Group Member
④ Other: _____

e) Your age: (optional) _____

f) Sex: (optional) ① Male ② Female

2. *Your Organizational Unit*

In this survey you will be asked to provide knowledge about your organization's use of collaborative work groups and support technology. If you are with a large company, you may not be able to accurately answer for the whole company. You may be a part of a smaller company or division within your parent organization, and may only be able to answer accurately for this smaller component, as opposed to the larger organization. Therefore, please respond to the rest of this section at the level (i.e., company or unit) at which you have the most knowledge of collaborative work groups in your company.

a) You will base all of your responses for the rest of Sections I and II on: Check ONLY one circle

① **your parent company** ② **your organizational unit**

b) If you are **not** answering for your parent company, please fill in the name of the largest organizational unit for which you are responding:

_____

c) Number of employees in company or organizational unit:

① Under 250 ② 250 - 1000 ③ 1000 - 5000
④ 5000 – 25,000 ⑤ 25,000 – 100,000 ⑥ 100,000 – 200,000 ⑦ 200,000 or more

3. Does your organization use collaborative work groups? ① Yes Continue ② No Please Stop Here and Return Survey

a) Which types of work groups are used in your organization? Please check all that apply

① ***Work Groups/Teams:*** *Produce goods or services for internal and external customers*

② ***Management Groups/Teams:*** *Coordinate the management of a number of other work groups*

③ ***Project Groups/Teams:*** *Complete a specific project, then usually disband upon completion*

④ ***Virtual Groups/Teams:*** *Work groups that must collaborate using technology due to limited ability to meet face-to-face*

b) Approximately how many of these groups would you say your organization has, overall?

① *1 - 4* ② *5 - 10* ③ *11 - 20* ④ *20 – 40* ⑤ 40 or more

c) How long has your organization used collaborative work groups?

① *Under 1 year* ② *1 - 2 years* ③ *2 - 5 years* ④ *5 - 10 years* ⑤ *10 years or more*

d) At what stage of development or maturity are **MOST** of your collaborative work groups operating?

Please check ONLY one

① ***Forming:*** *The group is newly-formed; norms have not yet been established.*

② ***Storming:*** *The group is frustrated and angry over differences between individual and group desires.*

③ ***Norming:*** *The members understand their roles, have shared norms, and are learning to work together.*

④ ***Performing:*** *The group understands the tasks and purpose, and performs as a team.*

⑤ ***Adjourning:*** *The group delivers results, provides support, wraps up details, and celebrates its endings.*

II. Company/Organizational Unit's Use of Technology-Supported Collaborative Work Groups

Please complete this section at the level (i.e., company or organizational unit) at which you have the most knowledge of how your company or organizational unit uses technology-supported collaborative work groups.

4. Do any of these collaborative work groups have to work with supportive technological tools because they have limited face-to-face contact (e.g., virtual teams)? ① Yes Continue ② No Please Stop Here and Return Survey

a) How many of these technology-supported work groups would you say your organization has, overall?

① *1 - 4* ② *5 - 10* ③ *11 - 20* ④ *20 – 40* ⑤ 40 or more

b) Approximately how many years has your organization used work groups that use technology to collaborate?

① *Under 1 year* ② *1 - 2 years* ③ *2 - 5 years* ④ *5 - 10 years* ⑤ *10 years or more*

c) What is the approximate number of people on these technology-supported work groups? Please fill in amounts

Minimum: ☐☐ Maximum: ☐☐ Average: ☐☐

d) Where are the members of these technology-supported work groups located?

① *In the same country* ② *Multinational* ③ *Both*

5. Do these work groups use technology to collaborate with any members from outside your organization (e.g., contractors, suppliers)? ① Yes Continue ② No Go to question 6

a) Please place a check mark beside all the members from outside your organization that are part of these work groups:

① *Contractors for outsource work* ② *Suppliers* ③ *Customers* ④ Other: _____

6. How **effective** are these technology-supported work groups at:

a) Communication, e.g., giving feedback, sharing info.	① Not effective	② Somewhat effective	③ Effective	④ Very effective
b) Planning tasks & setting goals	① Not effective	② Somewhat effective	③ Effective	④ Very effective
c) Solving problems & making decisions	① Not effective	② Somewhat effective	③ Effective	④ Very effective
d) Resolving conflict	① Not effective	② Somewhat effective	③ Effective	④ Very effective
e) Responding to customer requirements	① Not effective	② Somewhat effective	③ Effective	④ Very effective

7. Please fill in the circle which best describes how **important** each factor is in increasing the overall **effectiveness** of ***technology-supported work groups*** in your organization?

Not Important	Somewhat Important	Important	Very Important
①	②	③	④

a) *Training in how to work as a group*	① ② ③ ④
b) *Training in how to use collaborative technology tools*	① ② ③ ④
c) *Understanding cultural differences among group members*	① ② ③ ④
d) *Ease of use of collaborative tools*	① ② ③ ④
e) *Availability and quality of technical support*	① ② ③ ④
f) *Having a standard set of usable collaborative tools*	① ② ③ ④
g) *Technology infrastructure*	① ② ③ ④
h) *Face-to-face (same time/same place) kick-off event*	① ② ③ ④
i) *Same time/different place(NOT face-to-face) kick-off event*	① ② ③ ④
j) *Face-to-face (same time/same place) regularly scheduled group meetings*	① ② ③ ④
k) *Planning and holding effective work group meetings*	① ② ③ ④
l) *Communicating effectively without being face-to-face*	① ② ③ ④
m) *Problem-solving and making decisions in a work group*	① ② ③ ④
n) *Planning and managing task completion in a work group*	① ② ③ ④
o) *Setting well-defined goals and assessing performance in a work group*	① ② ③ ④
p) *Group facilitation and/or leadership*	① ② ③ ④
q) *Level of trust among group members*	① ② ③ ④

3

III. Your Involvement in Technology-Supported Collaborative Work Groups

*Please complete the following based on **your personal experiences** using technology tools in collaborative work groups.*

8. *Are **you** a member of one or more of these work groups that use technology to collaborate?*

① Yes Continue ② No Go to question 15

a) How many? ☐☐

b) What is the approximate number of people on these work groups?

Minimum: ☐☐ Maximum: ☐☐ Average: ☐☐

9. How long have you been working as a member of a work group that uses computer-based technology to collaborate?

① *Under 1 year* ② *1 - 2 years* ③ *2 - 5 years* ④ *5 - 10 years* ⑤ *10 years or more*

10. Where are your collaborative work group members located?

① *In the same country* ② *Multinational* ③ *Both*

11. Do your collaborative work groups include any members from outside your organization (e.g., contractors, suppliers)? ① Yes Continue ② No Go to question 13

a) Please place a check mark beside all the members from outside your organization that are part of these work groups:

① *Contractors for outsource work* ② *Suppliers* ③ *Customers* ④ Other: _____

12. How **effective** are **your** technology-supported work groups at:

a) Communication, e.g., giving feedback, sharing info.	① *Not effective*	② *Somewhat effective*	③ *Effective*	④ *Very effective*
b) Planning tasks & setting goals	① *Not effective*	② *Somewhat effective*	③ *Effective*	④ *Very effective*
c) Solving problems & making decisions	① *Not effective*	② *Somewhat effective*	③ *Effective*	④ *Very effective*
d) Resolving conflict	① *Not effective*	② *Somewhat effective*	③ *Effective*	④ *Very effective*
e) Responding to customer requirements	① *Not effective*	② *Somewhat effective*	③ *Effective*	④ *Very effective*

13. Do you receive training in ***how to work effectively as a collaborative work group?***

① Yes Continue ② No Go to question 14

a) Please do **two** things: **1.** Check the circles on the left that describe the purpose of this training and **2.** Check the circles on the right whether or not this training was required (i.e., yes or no).

	REQUIRED?	
① *How to use the technology infrastructure*	① Yes	② No
② *How to use technology tools (e.g., E-mail, document management)*	① Yes	② No
③ *How to effectively use technology tools in collaborative work groups (e.g., protocols on video-conferencing)*	① Yes	② No
④ *How to communicate member/group support without being face-to-face*	① Yes	② No
⑤ *How to collaborate effectively in a work group (e.g., managing conflict, understanding each other, generating new ideas)*	① Yes	② No
⑥ *How to problem-solve or make decisions in a work group*	① Yes	② No
⑦ *How to plan and hold work group meetings*	① Yes	② No
⑧ *How to plan and manage task completion in a work group*	① Yes	② No
⑨ *How to set goals and assess performance in a work group*	① Yes	② No
⑩ Other:_____	① Yes	② No

b) How ***effective*** is the training you received in helping you to:

1) Use technology effectively?	① *Not effective*	② *Somewhat effective*	③ *Effective*	④ *Very effective*
2) Work effectively as a collaborative work group?	① *Not effective*	② *Somewhat effective*	③ *Effective*	④ *Very effective*

c) Please indicate which methods are used to deliver this training:

① Computer-based training (CBT) ② One-on-one training ③ Classroom training
④ Demonstrations ⑤ Other: _____

d) How long does the training last?

① 4 hours or less ② 1-2 days ③ 3-5 days ④ More than 5 days

14. Has the use of collaborative technologies affected the attitudes or performance of individuals or work groups? ① Yes Continue ② No Go to question 15

a) If yes, please check circles that best describe those changes:

① *Sense of ownership & commitment*
② *Less job stress*
③ *More job satisfaction*
④ *Greater job stress*
⑤ *Decreased Absenteeism/Turnover*
⑥ *Longer Work Days/Hours (24-hr. job)*
⑦ *Improved work performance*
⑧ *Increased morale*
⑨ Other:_____

IV. Collaborative Work Technologies and Activities

15. For each of the following ***collaborative technology tools***, please check the ***collaborative work activities*** that they best support. * See the first row of the table for an example.

Collaborative Work Activity / Collaborative Tool	1) Meeting Planning/Mgmt. (i.e., scheduling, agenda development, meeting facilitation)	2) Sharing Information/Data	3) Creative Idea Generation (e.g., brain-storming)	4) Collaborative Problem-Solving & Decision-Making	5) Planning and Task Coordination	6)) Conflict Resolution	7) Goal Setting	8) Performance Monitoring & Evaluation	9) Communication for member/group support (e.g., team / trust-building, coaching)	10) Group Leadership
EXAMPLE: E-mail	✓	✓		✓	✓			✓	✓	✓
a) E-mail/ Electronic Messaging										
b) Audio Conferencing										
c) Conference Room Video Conferencing										
d) Desktop Videoconferencing										
e) Group Scheduling & Calendaring										
f) Electronic Whiteboarding										
g) Collaborative Presentation										
h) Document Management										
i) Electronic Group Authoring										
j) Project Management										
k) Knowledge Mgmt. (e.g., expert systems, info filters)										
l) Discussion Databases										
m) One-way Bulletin Boards										
n) Work Flow Management										
o) Web Browser										
p) Personal Communication Tools (e.g., Cell phones, laptops)										
q) Remote Dial-up Access										
r) Group Decision Support Systems										

* Please base your responses to all questions on the largest organizational unit for which you are comfortable responding.

V. Collaborative Work Group Tools

16. For each collaborative tool, please answer the questions across the top of the table. Please, circle responses in columns 1, 2, 3, 5, 7, 9 and write-in your responses in columns 4, 6 and 8.*

For this Collaborative Tool:	1) Do you use an external network? Yes (Y) No (N)	2) Frequency of use: D = daily W = weekly M = monthly Y = yearly (Circle)	3) Is training required? Yes (Y) No (N)	4) How long has your organization used it? (Months)	5) How successful is this tool? 1 = very unsuccessful 2 = unsuccessful 3 = successful 4 = very successful DK = don't know	6) Approx. % of employees currently using this tool:	7) Do you access this application through a web-based interface? Yes (Y) No (N)	8) We use these technologies: (e.g. Lotus Notes, Microsoft Exchange, Novell's GroupWise, etc.) List ALL you use.	9) Is there a corporate standard set of tools? Yes (Y) No (N)	10) Approx. % of employees that will be using it in 2 years:
EXAMPLE: E-mail	(Y) N	(D) W / M / Y	(Y) N	60 Mos.	1 2 3 (4) DK	80 %	Y (N)	Lotus Notes	(Y) N	100 %
a) E-mail/Electronic Messaging	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
b) Audio Conferencing	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
c) Conference Room Video Conferencing	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
d) Desktop Videoconferance	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
e) Group Scheduling & Calendaring	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
f) Electronic Whiteboarding	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
g) Collaborative Presentation	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
h) Document Management	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%

* Please base your responses to all questions on the largest organizational unit for which you are comfortable responding.

16. ***Collaborative Work Group Tools, continued***

For each collaborative tool, please answer the questions across the top of the table. Please, circle responses in columns 1, 2, 3, 5, 7, 9 and write-in your responses in columns 4, 6 and 8.*

For this Collaborative Tool:	1) Do you use an external network? Yes (Y) No (N)	2) Frequency of use: D = daily W = weekly M = monthly Y = yearly (Circle)	3) Is training required? Yes (Y) No (N)	4) How long has your organization used it? (Months)	5) How successful is this tool? 1 = very unsuccessful 2 = unsuccessful 3 = successful 4 = very successful DK = don't know	6) Approx. % of employees currently using this tool:	7) Do you access this application through a web-based interface? Yes (Y) No (N)	8) We use these technologies: (e.g. Lotus Notes, Microsoft Exchange, Novell's GroupWise, etc.) List ALL you use.	9) Is there a corporate standard set of tools? Yes (Y) No (N)	10) Approx. % of employees that will be using it in 2 years:
i) Group Authoring	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
j) Project Management	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
k) Knowledge Mgmt. (e.g., expert systems, filters)	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
l) Discussion Databases	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
m) One-way Bulletin Boards	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
n) Work Flow Management	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
o) Web Browser	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
p) Personal Communication Tools (e.g., Cell phones, laptops)	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
q) Remote Dial-Up Access	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
r) Group Decision Support Systems	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%
s) Other	Y / N	D / W / M / Y	Y / N	Mos.	1 2 3 4 DK	%	Y / N		Y / N	%

* Please base your responses to all questions on the largest organizational unit for which you are comfortable responding.

VI. Collaborative Technology Management and Support

Please respond to this section at the level (i.e., company or organizational unit) at which you have the most knowledge of collaborative technology management and support.

17. Please check the circle which best describes how **important** each factor is to the **successful implementation** of **collaborative work group technology** in your organization?

	Not Important	Somewhat Important	Important	Very Important
	①	②	③	④

a)	*Involving the users in the design and implementation of collaborative technology*	① ② ③ ④
b)	*Communicating the strategy for collaborative technology implementation to users*	① ② ③ ④
c)	*Training in how to work as a group*	① ② ③ ④
d)	*Training in how to use collaborative technology tools*	① ② ③ ④
e)	*Allowing employees adequate time to learn new skills*	① ② ③ ④
f)	*Having a standard set of usable collaborative tools*	① ② ③ ④
g)	*Availability and quality of technology support*	① ② ③ ④
h)	*Technology infrastructure*	① ② ③ ④
i)	*Policies and procedures which support collaborative work*	① ② ③ ④
j)	*Policies and procedures which support technology use*	① ② ③ ④
k)	*Policies and procedures which support the integration of collaborative work and technology*	① ② ③ ④
l)	*Organization restructured to perform collaborative work*	① ② ③ ④
m)	*Supportive organizational climate*	① ② ③ ④

18. Has your organization made changes in the systems that support collaborative technologies in work groups?

❒ Yes Continue ❒ No Go to question 19

a) Please check all that describe the changes your organization has made:

① *Assessing collaborative work group performance*
② *Rewarding collaborative work group performance*
③ *Developing lateral paths of career progression (e.g., group-to-group or job-to-job within a team)*
④ *HR policies and practices (e.g., training in technology and collaboration)*
⑤ *New roles for IT functions (e.g., from IT expert to cross-functional collaborator)*
⑥ *Organization restructured to promote collaborative work across time and distance (e.g., network organization)*
⑦ *New roles for senior managers (e.g., becoming part of a technology-based collaborative work group)*
⑧ *Connecting customers and/or suppliers to your organization with collaborative technologies*
⑨ *Other:* _____

19. Please share with us what your organization or organizational unit has done to increase the effective use of technology in collaborative work groups.

a) Technical implementation: _____

_____

b) Increasing user understanding and acceptance: _____

_____

c) Other: _____

_____

20. How effective is your organization at:

a) **Implementing** technology supported work groups?

① *Not effective* ② *Somewhat effective* ③ *Effective* ④ *Very effective*

b) **Developing systems** to support the continued use of technology supported work groups?

① *Not effective* ② *Somewhat effective* ③ *Effective* ④ *Very effective*

21. Is there a designated collaborative work group technology coordinator or manager in your organization?

① Yes Continue ② *No* Go to question 23

a) What is their title? _____

b) To whom (i.e., position/title) or where in the organization does this person report? Check ONLY one circle

① *CEO* ② *VP/CIO* ③ *Director/Manager* ④ *Supervisor* ⑤ Other: _____

22. a) To what extent is your organization committed to investing in the use of collaborative tools? Check ALL that apply

① *Not Committed* ② *Committed* ③ *Separate Budget Item*

b) To what extent is your organization committed to providing support for using these collaborative tools?

Check ALL that apply

① *Not Committed* ② *Committed* ③ *Separate Budget Item*

VII. Future Use of Collaborative Technologies

23. a) What collaborative technology tools do you plan to acquire in the next 2-3 years and why?

_____

_____

_____

b) Are there any collaborative technology tools you plan to drop in the near future and why?

_____

_____

_____

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Thank you very much for your time and assistance!

Please return the survey in the enclosed envelope to:

Collaborative Work Group Technology Survey Team
Center for the Study of Work Teams
University of North Texas
P.O. Box 311280
Denton, TX 76203-1280

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